

PRODUCT : CAMERA MODULE
MODEL NO. : CM8039-A200BA-E
SUPPLIER : TRULY SEMICONDUCTORS LTD.
DATE : November 10, 2007



CERT. No. 946535
ISO9001
TL9000

SPECIFICATION

Revision: 0.1

CM8039-A200BA-E

preliminary

If there is no special request from customer, TRULY SEMICONDUCTORS Co., Ltd will not reserve the tooling of the product under the following conditions:

1. There is no response from customer in two years after TRULY SEMICONDUCTORS Co., Ltd submit the samples;

2. There is no order in two years after the latest mass production.

And correlated data (include quality record) will be reserved one year more after tooling was discarded.

TRULY SEMICONDUCTORS LTD: CUSTOMER:

Quality Assurance Department: _____

Approved by:

Technical Department: _____

Approved by:

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| WRITTEN BY | CHECKED BY | APPROVED BY |
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Key Information

| Module No. | | CM8039-A200BA-E |
|------------------------------------|--------|---|
| Module Size | | 10.0mm x 10.0mm x7.30mm |
| Image Quality | | ≥600 TV line |
| Sensor Type | | S5K4BAFB |
| Array Size | | 1600 X 1200(UXGA) |
| Power supply | Core | 1.5V |
| | Analog | 2.8V |
| | I/O | 1.8V/2.8V |
| Lens | | 1/4 inch 4Plastic+IR |
| Focus(F.NO) | | 2.8 |
| View Angle | | 65° |
| Object distance | | 8cm-infinity |
| MAX Frame rate | | 15fps@UXGA, |
| Pixel size | | 2.25um X2.25um |
| IR Cutter | | 650+/-10nm |
| Color filter | | RGB Bayer Pattern |
| Sensor Operation Temperature Range | | -20° C to 60° C |
| Output Formats | | 8-Bit ITU-R.656/601(4;2;2YCbcr),565RGB, |
| Image scaling | | SXGA,VGA,QVGA,QQVGA,CIF,QCIF |
| Maximum Pixel(data output) clock | | 75MHz |
| ADC resolution | | 10Bit |
| IC Package | | COB |
| Substrate | | FPC |

Pin Assignment

| No. | Name | Pin type | Description |
|-----|--------|------------------|---|
| 1 | AF_EN | Power | Auto Focus enable 0: Auto Focus function power down 1: Auto Focus function enable |
| 2 | AGND | Power | Analog Ground |
| 3 | SIO_D | I/O | I2C Clock/Data for backend processor |
| 4 | AVDD | Power | Analog Power 2.8V |
| 5 | SIO_C | I/O | I2C Clock/Data for backend processor |
| 6 | RESET | Input | Master Reset (Active Low) |
| 7 | VSYNC | Tri-state Output | Vertical sync Output |
| 8 | PWDN | Input | Stand-By Mode (Active low,set to "1"if not used) |
| 9 | HREF | Tri-state Output | Horizontal Sync Output |
| 10 | DVDD | Power | Regulator Power for Core Digital |
| 11 | DOVDD | Power | I/O Digital Power(2.8V-1.8V) |
| 12 | D7 | Tri-state Output | Pixer Data Output [7] |
| 13 | XCLK | Input | Master Clock |
| 14 | D6 | Tri-state Output | Pixer Data Output [6] |
| 15 | GND | Power | Ground |
| 16 | D5 | Tri-state Output | Pixer Data Output [5] |
| 17 | PCLK | Tri-state Output | Pixel Clock Output |
| 18 | D4 | Tri-state Output | Pixer Data Output [4] |
| 19 | D0 | Tri-state Output | Pixer Data Output [0] |
| 20 | D3 | Tri-state Output | Pixer Data Output [3] |
| 21 | D1 | Tri-state Output | Pixer Data Output [1] |
| 22 | D2 | Tri-state Output | Pixer Data Output [2] |
| 23 | AF_VDD | Power | Power supply for VCM |
| 24 | AF_GND | Power | VCM Ground |

Electrical Characteristics

1. Absolute Maximum Ratings

| Characteristics | Symbol | Value | Unit |
|---------------------------------|--------------------------------------|-------------|------|
| I/O Digital Power (2.8V ~ 1.8V) | V _{DDIO1} ⁽¹⁾ | -0.3 to 3.8 | V |
| | V _{DDIO2} ⁽²⁾ | -0.3 to 2.5 | |
| Analog Power (2.8V) | V _{DDA} | -0.3 to 3.8 | |
| Regulator Power (1.8V) | V _{DD18_REG} ⁽³⁾ | -0.3 to 2.5 | |
| Core Digital Power (1.5V) | V _{DD15} ⁽⁴⁾ | -0.3 to 2.0 | |
| Input Voltage | V _{IN} | -0.3 to 3.8 | |
| Operating Temperature | V _{OPR} | -20 to +60 | °C |
| Storage Temperature | V _{STG} | -40 to +85 | |

[NOTE]

(1) 2.8V I/O Power Applied to VDDIO pins

(2) 1.8V I/O Power Applied to VDDIO pins

(3) 1.8V Regulator Power Applied to VDD18_REG pins

(4) Internal Regulator is not used and 1.5V Digital Power Applied to VDD15 pins directly

2.DC Characteristics

(V_{DDH} = 2.8V ± 0.25V, V_{DDL} = 1.5V ± 0.1V, Ta = -20 to + 60 °C)

| Characteristics | Symbol | Condition | Min | Typ | Max | Unit |
|---|-----------------------|---|------------------------|-----|------------------------|------|
| Operating voltage | V _{DD28_CIS} | Applied to VDD28_CIS | 2.55 | 2.8 | 3.05 | V |
| | V _{DD18_REG} | Applied to VDD18_REG | 1.65 | 1.8 | 1.95 | |
| | V _{DD15} | Applied to VDD15 | 1.40 | 1.5 | 1.60 | |
| | V _{DDIO1} | Applied to VDDIO | 2.55 | 2.8 | 3.05 | |
| | V _{DDIO2} | Applied to VDDIO | 1.65 | 1.8 | 1.95 | |
| Input voltage ⁽¹⁾ | V _{IH} | - | 0.7* V _{DDIO} | - | - | |
| | V _{IL} | - | - | - | 0.2* V _{DDIO} | |
| Input leakage current ⁽²⁾ | I _{IL} | V _{IN} = V _{DDH} to V _{SS} | -10 | - | 10 | uA |
| Input leakage current with pull-down ⁽³⁾ | I _{ILD} | V _{IN} = V _{DDH} | 5 | 18 | 40 | |
| Input leakage current with pull-up ⁽⁴⁾ | I _{ILU} | V _{IN} = V _{SS} | -40 | -18 | -5 | |

| | | | | | | |
|-----------------------------------|------------------|---|------------------------|-----|-----------------------|----|
| High level output voltage | V _{OH} | I _{OH} = -100uA ⁽⁴⁾⁽⁵⁾ | V _{DDIO} -0.2 | - | - | V |
| | | I _{OH} = -4mA ⁽⁴⁾ I _{OH} = -2,-4,-6,-8mA ⁽⁵⁾ | 0.7*V _{DDIO} | | | |
| Low level output voltage | V _{OL} | I _{OL} = 100uA ⁽⁴⁾⁽⁵⁾ | - | - | 0.2 | |
| | | I _{OL} = 4mA ⁽⁴⁾ I _{OL} = 2,4,6,8mA ⁽⁵⁾ | | | 0.3*V _{DDIO} | |
| High-Z output leakage current (6) | I _{OZ} | V _{OUT} = V _{SS} or V _{DDH} | -10 | - | 10 | uA |
| Input capacitance ⁽¹⁾ | C _{IN} | - | - | - | 4 | pF |
| Supply current | I _{STB} | STBYN=Low(Active) All input clocks = Low 0 lux illumination | - | 40 | 150 | uA |
| | I _{DD} | f _{MCLK} = 27MHz | - | 130 | 180 | mA |
| Operation Power Consumption | P _{OP} | - | - | 200 | 300 | mW |

[NOTE]

- (1) Applied to STRB_IN, SCL, SDA, CLKSEL, TST, STBYN, SCE, RSTN, MCLK, AF_SCL, AF_SDA, IIC_ID pins
- (2) Applied to SCL, SDA, CLKSEL, STBYN, RSTN, MCLK, AF_SCL, AF_SDA pins
- (3) Applied to STRB_IN, TST, SCE, IIC_ID pins
- (4) Applied to HSYNC, VSYNC pins
- (5) Applied to SCL, SDA, PCLK, D0 to D9 pins
- (6) Applied to SCL, SDA pins when in High-Z output state
Applied to HSYNC, VSYNC, PCLK, D0 to D9 pins when in Stand-by Mode

3. Electrical Characteristics

| INDEX | Electrostatic Standard | | | UNIT | Remark |
|------------------|------------------------|---------------|---|------|--------|
| | PIN NO. | Design Target | Reference Product | | |
| Human Body Model | ALL | • 2000V | | V | |
| Machine Model | ALL | • 200V | | V | |
| Latch-up | I-Test | ALL | Positive trigger : +(I _{nominal} + 100mA) Negative trigger : -100mA | mA | |
| | V-Test | Power | 1.5X Max V _{supply} | V | |

Note: For more information of sensor please refer to the S5K4BAFB specification.

Mechanical Drawing

Appearance Specification

| NO. | Item | Standard | Importance Class |
|-----|------------------|--|------------------|
| 1 | Top side of Lens | No obvious impurity and oil impurity on the front of lens within the half area; The defect(unfeeling) limitation: width \leq 1mm, length \leq 2mm, the defect number \leq 2; No feeling defect; The width of defects and gaps on the outside of Lens \leq 0.3mm. Others are unlimited. | A |
| 2 | Screw glue | Normally screw glue shall be symmetrical distributed around lens circle side. Particular circs, glue distribution must not disturb customer's assembly operation. | A |
| 3 | L1 Glass | No defect and dust check from 45° angle under the reflexing light and from 0° under the highlight | A |
| 4 | Holder | No obvious impurity and distortion of outline. The width and length of defect is unlimited, the depth \leq 0.1mm and \leq 1/4 of the thickness of Holder. | B |
| 5 | Sealed glue | Sealed glue distributing between holder and FPC must be symmetrical and smooth. Not allow glue leakage and asymmetric thickness. After holder assembly, the thickness distance between one side and its opposite side shall be less than 0.2mm. Excess glue over the holder shall not make the outside dimension be out of control. | A |
| 6 | FPC/PCB | Edge defect limitation: width \leq 1/2H (H is minimum.)、 length \leq 1mm、 defect numbers per edge \leq 2(No tearing gap inby edge for FPC); Edge outshoot limitation (width \leq 0.3mm, length \leq 1mm). No obvious impurity and crease on the surface. If there was shield film on the surface, the spot size of the film shall be less than 0.3mm \times 1mm and no line is exposed. If it was not be cleaned and did not influence the total thickness, it would be permitted. Label and mark shall be clear enough to be discerned. | A |
| 7 | Connector | No dust, fingerprint, and not allows to turning colors, distortion; Solder must be well; No open circuit or short circuit | A |

| | | | |
|----|---------------------|--|---|
| 8 | Gold finger | No dust, fingerprint, and not allows to turning colors, burned, unsmoothed and peeled; No open circuit or short circuit; The defect width shall be smaller than 20% of gold finger's width. No copper/nickel exposed in defect. Numbers of defected pin shall be less than 3. The defect limitation:width \leq 0.08mm,length \leq 5mm. | A |
| 9 | Stiffener | Holder anchor pole length overtopping the steel plate shall be less than 0.2mm. No dust, rust and deep scratch on the steel surface without Double coated tapes. | B |
| 10 | Double coated tapes | Adhered direction shall be right. Not allows to excess steel plate edge. No alveoli and stick. Not allows to peel glue and rip protective paper when tear the protective paper. | B |
| 11 | Protective film | No dust in the glue side. Not allows to float or drop. Adhered direction shall be right. | B |

Remark:

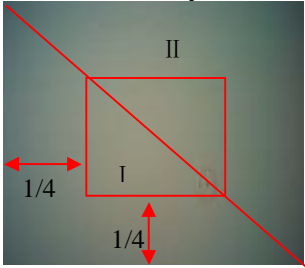
1. The definition of the appearance importance class

- A: The defect can be found in the finished product, or have obvious visual differences from good products, such as crack, defect and dust, or influence image quality, or are appointed by the customer. We will emphasize these items and check all products.
- B: The defect can be found in the finished product and has visual difference from the good one, but will not affect customer's aesthetic judgement. Or the defect can not be found in the finished product and will not generate functional problem, but will slightly influence sequential manufacture process or condition. We will supervise these items in the manufacturing process and check products selectively.

2. Sampling standard

Referenced standard: GB/T 2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC.4-1993 II

Image Specification

| NO. | Item | Standard | Important Class |
|-----|---|--|-----------------|
| 1 | TV Line | Center \geq 700 8 point of 0.7 viewing field \geq 600 | A |
| 2 | Shading | The lightness of 90% viewing area \geq 40% of center lightness(Lens correction Shading [Turn off]); The lightness of 90% viewing area \geq 60% of center lightness(Lens correction Shading [Turn on]) | A |
| 3 | Dust | No dust in the center viewing area; Border area according to the limit samples | A |
| 4 | Dead pixel | No in the viewing area. | A |
| 5 | Wound pixel  | I area: Blemish number \leq 1 II area: Blemish number \leq 4 | B |
| 6 | Color | Color distortion ratio of center \pm 15% | B |
| 7 | Gray Scale | Margin of two near scales' brightness \geq 6 | B |
| 8 | Distortion | $<$ 1% | B |
| 9 | Flare | No flare in 45° viewing angle; No ghost in full viewing angle | B |

QA Plan

| NO. | Item | Sampling frequency | Measure | Remark |
|----------------------------|---------------------|--------------------|--------------------|-----------------|
| Image and reliability item | | | | |
| 1 | TV Line | AQL 0.65 II Class | Same as production | 100% Inspection |
| 2 | Shading | AQL 0.65 II Class | Same as production | 100% Inspection |
| 3 | Dust | AQL 0.65 II Class | Same as production | 100% Inspection |
| 4 | Dead pixel | AQL 0.65 II Class | Same as production | 100% Inspection |
| 5 | Wound pixel | AQL 1.5 II Class | Same as production | 100% Inspection |
| 6 | Color | AQL 1.5 II Class | Same as production | 100% Inspection |
| 7 | Gray Scale | AQL 1.5 II Class | Same as production | 100% Inspection |
| 8 | Distortion | N=5,c=0 per batch | Same as production | Sampling by QA |
| 9 | Flare | N=5,c=0 per batch | Same as production | Sampling by QA |
| Appearance Check Items | | | | |
| 1 | Top side of Lens | AQL 1.0 II Class | Same as production | 100% Inspection |
| 2 | Screw glue | AQL 1.0 II Class | Same as production | 100% Inspection |
| 3 | L1 Glass | AQL 1.0 II Class | Same as production | 100% Inspection |
| 4 | Holder | AQL 1.5 II Class | Same as production | 100% Inspection |
| 5 | Sealed glue | AQL 1.0 II Class | Same as production | 100% Inspection |
| 6 | FPC/PCB | AQL 1.0 II Class | Same as production | 100% Inspection |
| 7 | Connector | AQL 1.0 II Class | Same as production | 100% Inspection |
| 8 | Gold finger | AQL 1.0 II Class | Same as production | 100% Inspection |
| 9 | Stiffener | AQL 1.5 II Class | Same as production | 100% Inspection |
| 10 | Double coated tapes | AQL 1.5 II Class | Same as production | 100% Inspection |
| 11 | Protective film | AQL 1.5 II Class | Same as production | 100% Inspection |

Sample:

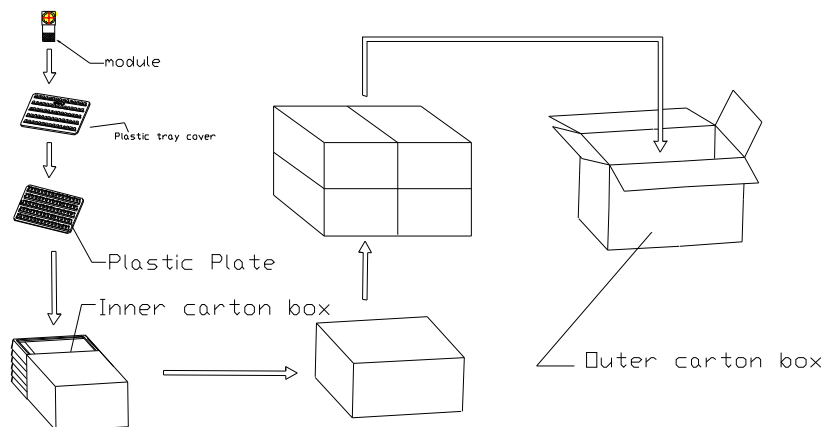
Referenced standard: GB/T 2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC.4-1993 II

Package Specification

Packaging Design One

| | | | | | | | | | |
|--|---------------------------|------------------|---|---------|----------|-----|----------------|---------------------|---------|
| Product No. | CM8039-A200BA-E | Release date | | | | | | | |
| Product name | Compact Camera Module | Releaser | | | | | | | |
| Supplier | TRULY SEMI CONDUCTORS LTD | Recycle | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | | | | | |
| Quantity/ each box | TBD | Material for box | <input checked="" type="checkbox"/> paper <input type="checkbox"/> plastic | | | | | | |
| Outer carton box size | 405mm*290mm*290mm | Box type | <input checked="" type="checkbox"/> new <input type="checkbox"/> update | | | | | | |
| Quantity / inner box * Quantity / outer box | TBD | Weight | <table border="1"> <tr> <td>g / pcs</td> <td>BOX=TYPE</td> <td>TBD</td> </tr> <tr> <td>Kg / outer box</td> <td>Record of SRF Dept.</td> <td>Kg(Max)</td> </tr> </table> | g / pcs | BOX=TYPE | TBD | Kg / outer box | Record of SRF Dept. | Kg(Max) |
| g / pcs | BOX=TYPE | TBD | | | | | | | |
| Kg / outer box | Record of SRF Dept. | Kg(Max) | | | | | | | |

Packing Standards:



There are TBD modules each plastic plate.

There are TBD modules each inner carton box..

There are 4 each outer carton box.

Requirements of outer carton box :

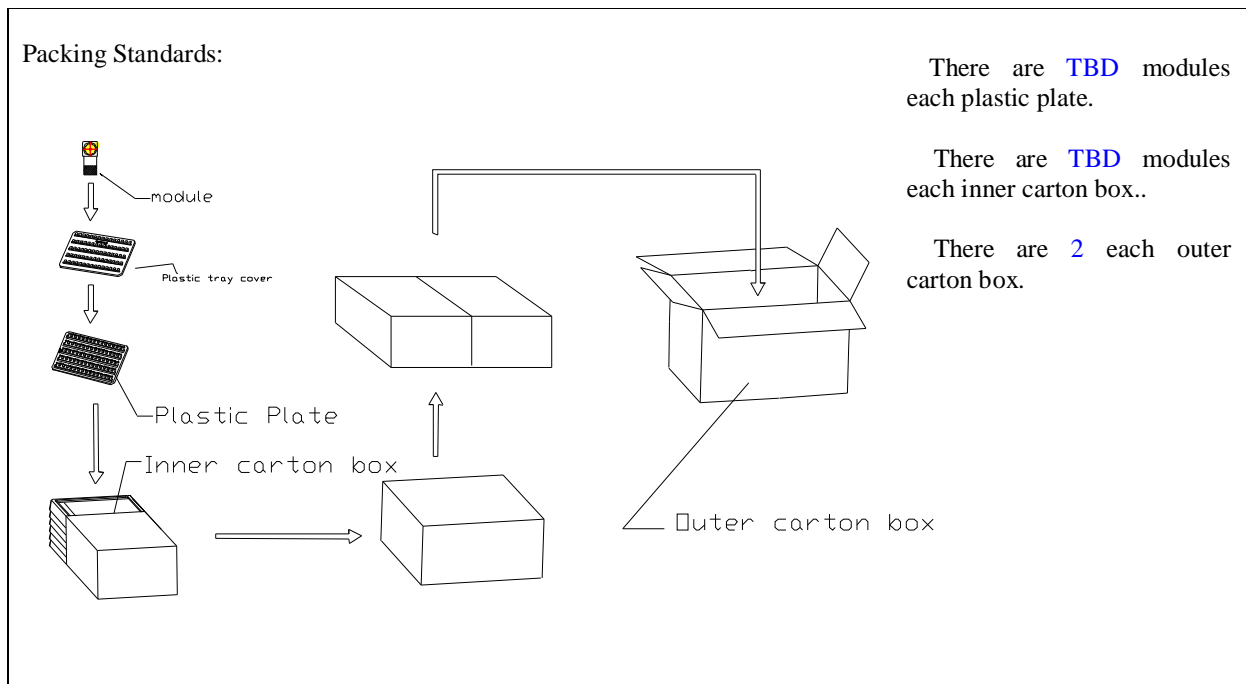
1. Weight(Max): TBD Kg
2. Height (Max): 0.29 M
3. Prohibition: Box made by log

Material for Plastic tray

It is made of antistatic polystyrene which has no chemical pollution. Surface resistivity : 10^6 ohm/sq

Packaging Design Two

| | | | |
|--|---------------------------|------------------|--|
| Product No. | CM8039-A200BA-E | Release date | |
| Product name | Compact Camera Module | Releaser | |
| Supplier | TRULY SEMI CONDUCTORS LTD | Recycle | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |
| Quantity/ each box | TBD | Material for box | <input checked="" type="checkbox"/> paper <input type="checkbox"/> plastic |
| Outer carton box size | 405 mm *280 mm *170 mm | Box type | <input checked="" type="checkbox"/> new <input type="checkbox"/> update |
| Quantity / inner box * Quantity / outer box | TBD | Weight | |
| | | ht | |
| | | g / pcs | BOX-TYPE |
| | | Kg / outer box | Record of SRF Dept. |
| | | | TBD Kg(Max) |



Requirements of outer carton box :

4. Weight(Max): TBD Kg
5. Height (Max): 0.17 M
6. Prohibition: Box made by log

Material for Plastic tray

It is made of antistatic polystyrene which has no chemical pollution. Surface resistivity : 10^6 ohm/sq

PRIOR CONSULT MATTER

- 1.①For Truly standard products, we keep the right to change material, process for improving the product property without notice on our customer.
②For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
2. If you have special requirement about reliability condition, please let us know before you start the test on our samples.

FACTORY CONTACT INFORMATION

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